



SEQUENCE LISTING

<110> Falco, Saverio
Allen, Stephen
Anderson, Shawn

<120> Genes Encoding Sulfate Assimilation Proteins

<130> BB-1167-B

<140> 09/720,384

<141> 2000-12-21

<150> 60/092,833

<151> 1998-07-14

<160> 14

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<210> 1

<211> 890

<212> DNA

<213> Zea mays

<400> 1

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tcgtctgcat cgccagcctc atatcgccct acagaagcga ccgaagcgcg tgtcgcgatc 420
tgctgcccaa gcactcgttt atcgaggtgt tcctggacgt gccgcttcaa gtgtgcgaag 480
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gcgactgccc ttgcctgaa tcgatggctg gtcacgttgt gtcgtacctt gagacgaatg 660
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gcagccggag cggcattgcc aaggctgtgt aatctcatgg ctgtctttct ctttaagacc 780
aaaacaaaca agagatggca gtgtaaaaag gaaaaaaaaa actgcgtctg acagagtcgc 840
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<210> 2

<211> 224

<212> PRT

<213> Zea mays

<400> 2

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      20             25             30
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```
Ala Ile Gly Gln Lys Glu Arg Gln Gly Leu Leu Asn Gln Lys Gly Cys
      35             40             45
```

```
Val Val Trp Ile Thr Gly Leu Ser Gly Ser Gly Lys Ser Thr Leu Ala
      50             55             60
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Cys Ala Leu Ser Arg Glu Leu His Gly Arg Gly His Leu Thr Tyr Val
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RECEIVED
MAY 03 2002
TECH CENTER 1600/2900

65		70		75		80
Leu Asp Gly Asp Asn	Leu Arg His Gly	Leu Asn Arg Asp	Leu Ser Phe			
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Gly Ala Glu Asp Arg	Ala Glu Asn Ile	Arg Arg Val Gly	Glu Val Ala			
	100	105	110			
Lys Leu Phe Ala Asp	Ala Gly Leu Val	Cys Ile Ala Ser	Leu Ile Ser			
	115	120	125			
Pro Tyr Arg Ser Asp	Arg Ser Ala Cys	Arg Asp Leu Leu	Pro Lys His			
	130	135	140			
Ser Phe Ile Glu Val	Phe Leu Asp Val	Pro Leu Gln Val	Cys Glu Ala			
	145	150	155	160		
Arg Asp Pro Lys Gly	Leu Tyr Lys Leu	Ala Arg Ala Gly	Lys Ile Lys			
	165	170	175			
Gly Phe Thr Gly Ile	Asp Asp Pro Tyr	Glu Pro Pro Ser	Asp Cys Glu			
	180	185	190			
Ile Val Ile Gln Cys	Lys Val Gly Asp	Cys Pro Ser Pro	Glu Ser Met			
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Ala Gly His Val Val	Ser Tyr Leu Glu	Thr Asn Gly Phe	Leu Gln Asp			
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 <213> Zea mays

<400> 3

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gacgccgacg	ctcgccgtca	tcctcgtaaa	tccacagcgc	gcgcctcccg	tcctcccagg	180
cctcaccctt	agcgatgcgc	cactcccggc	gctcgtgatc	catggcctca	ctccccgttc	240
ctcacactct	tccgcgggtc	tcgccagtga	tagtgggcgc	cgcgaggggg	agggccgcgg	300
tgcgcgtacg	cactgccacc	gcggcattgg	gcgggtgggtg	cggcgggcgg	ggcggaatgg	360
agcagcgcgc	ggggaggccc	cgcacagccc	agtgaaggag	aagcctgtaa	tgtcgaacat	420
tgggaaatcg	actaatat	tatggcacia	ttgcttgatt	ggacaatctg	atagacagaa	480
attgctggga	caaaaaggct	gtgtcgtatg	gataacagga	ctcagtgggt	cagggaaaag	540
tactcttgca	tgtgactga	gtcgtgagtt	gcattgcaga	ggccacctca	cgtatgtact	600
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atgcattgct	agcttgatat	ctccatacag	gagagatcgt	gatgcatgcc	gtgctctact	780
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tgatgatcca	tacgaaccac	caattaatgg	tgagatagta	attaagatga	aagatgagga	960
atgcccttca	cccaaagcaa	tggccaagca	agttctatgc	taccttgaag	aaaacggata	1020
tttgcaagct	tagtatatgt	atgttgagaa	gattgatctg	attcttgtgt	gtccattact	1080
tgtggacaca	ataagatctg	ttgttggtca	catgaataaa	aggcatcaac	atgtaggaag	1140
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 <211> 343
 <212> PRT
 <213> Zea mays

<400> 4

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			20					25					30		
Gln	Gly	Asn	Thr	Leu	Leu	Ser	Pro	Thr	Pro	Thr	Leu	Ala	Val	Ile	Leu
		35					40					45			
Val	Asn	Pro	Gln	Arg	Ala	Pro	Pro	Val	Leu	Pro	Gly	Leu	Thr	Pro	Ser
	50					55					60				
Asp	Ala	Pro	Leu	Pro	Ala	Leu	Val	Ile	His	Gly	Leu	Thr	Pro	Arg	Ser
65					70					75					80
Ser	His	Ser	Ser	Ala	Gly	Leu	Ala	Ser	Asp	Ser	Gly	Arg	Arg	Glu	Gly
				85					90					95	
Glu	Gly	Arg	Gly	Ala	Arg	Thr	His	Cys	His	Arg	Gly	Ile	Gly	Arg	Trp
			100					105					110		
Val	Arg	Arg	Arg	Arg	Arg	Asn	Gly	Ala	Ala	Pro	Gly	Glu	Ala	Pro	His
	115						120					125			
Ser	Pro	Val	Lys	Glu	Lys	Pro	Val	Met	Ser	Asn	Ile	Gly	Lys	Ser	Thr
	130					135					140				
Asn	Ile	Leu	Trp	His	Asn	Cys	Leu	Ile	Gly	Gln	Ser	Asp	Arg	Gln	Lys
145					150					155					160
Leu	Leu	Gly	Gln	Lys	Gly	Cys	Val	Val	Trp	Ile	Thr	Gly	Leu	Ser	Gly
				165					170					175	
Ser	Gly	Lys	Ser	Thr	Leu	Ala	Cys	Ala	Leu	Ser	Arg	Glu	Leu	His	Cys
			180					185					190		
Arg	Gly	His	Leu	Thr	Tyr	Val	Leu	Asp	Gly	Asp	Asn	Leu	Arg	His	Gly
		195					200					205			
Leu	Asn	Arg	Asp	Leu	Ser	Phe	Lys	Ala	Glu	Asp	Arg	Ala	Glu	Asn	Ile
	210					215					220				
Arg	Arg	Val	Gly	Glu	Val	Ala	Lys	Leu	Phe	Ala	Asp	Ala	Gly	Val	Ile
225					230				235						240
Cys	Ile	Ala	Ser	Leu	Ile	Ser	Pro	Tyr	Arg	Arg	Asp	Arg	Asp	Ala	Cys
				245					250					255	
Arg	Ala	Leu	Leu	Pro	His	Ser	Asn	Phe	Ile	Glu	Val	Phe	Ile	Asp	Leu
		260						265					270		
Pro	Leu	Lys	Ile	Cys	Glu	Ala	Arg	Asp	Pro	Lys	Gly	Leu	Tyr	Lys	Leu
		275					280					285			
Ala	Arg	Thr	Gly	Lys	Ile	Lys	Gly	Phe	Thr	Gly	Ile	Asp	Asp	Pro	Tyr
	290					295					300				
Glu	Pro	Pro	Ile	Asn	Gly	Glu	Ile	Val	Ile	Lys	Met	Lys	Asp	Glu	Glu
305					310					315					320

Cys Pro Ser Pro Lys Ala Met Ala Lys Gln Val Leu Cys Tyr Leu Glu
325 330 335

Glu Asn Gly Tyr Leu Gln Ala
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<211> 431
<212> DNA
<213> Oryza sativa

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<222> (48)
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<220>
<221> unsure
<222> (346)
<223> n = A, C, G or T

<220>
<221> unsure
<222> (431)
<223> n = A, C, G or T

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aagctactga agcagaaagg ttgcgttggt ttgatcacag gacttagtgg ttcaggtaaa 180
agtagccttg catgcacatt agatcgagag ctccatacaa gagggaagct ttcttatgtt 240
cttgatggtg ataatttaag acatggtttg aacaaggatc ttggctttta ggcggaagac 300
cgtgctgaaa atatacgcaa agttggtgag gtagcaaagc tattcncaga tgcaagccta 360
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<211> 118
<212> PRT
<213> Oryza sativa

<220>
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<222> (98)
<223> Xaa = ANY AMINO ACID

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Gly Gln Ala Asp Arg Gln Lys Leu Leu Lys Gln Lys Gly Cys Val Val
20 25 30
Trp Ile Thr Gly Leu Ser Gly Ser Gly Lys Ser Thr Leu Ala Cys Thr
35 40 45
Leu Asp Arg Glu Leu His Thr Arg Gly Lys Leu Ser Tyr Val Leu Asp
50 55 60

Gly Asp Asn Leu Arg His Gly Leu Asn Lys Asp Leu Gly Phe Lys Ala
 65 70 75 80
 Glu Asp Arg Ala Glu Asn Ile Arg Lys Val Gly Glu Val Ala Lys Leu
 85 90 95
 Phe Xaa Asp Ala Ser Leu Val Cys Ile Ala Ser Phe Lys Ser Pro Tyr
 100 105 110
 Lys Arg Glu Arg Glu Ser
 115

<210> 7
 <211> 936
 <212> DNA
 <213> Glycine max

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 gtcactggat tgcactgcgg ccgccgaggc ctcgctctcg tcctccgtgc aaaatcaaag 180
 ccgattaggg cgaaggagaa cgcaagcgta agtgcttctc tgatcgatga ctggttcaag 240
 ccaattacgg cgaaggagga ttctaacgca gaggaccgta catcttcgtt ttctggtaaa 300
 aatctcacc cagatgtcaaa tgttggaac tcgacaaaca ttatgtggca tgactgtcca 360
 attcagaaac aagatagaca gcagctgctt cagcaacaag gctgtgttat atggctaact 420
 ggcctcagcg gatcaggaaa aagcactatt gcatgtgctc tgagtcaaag cttgcactcc 480
 aaaggaaaac tgtcttacat ccttgatggt gacaatattc ggcatggtct aaaccaggat 540
 cttagtttta gacgagaaga tcgttctgaa aacattagaa ggattggtga ggtggcaaaa 600
 ctctttgcag atgctggtgt tatttgcac actagttaa tatcaccata ccaaaggat 660
 agagatgcat gcagagcact actttcaaaa ggagatttta ttgaggtttt catagatgtt 720
 ccactacatg tgtgtgaagc tagggaccca aagggactct acaagcttgc tcgagctgga 780
 aagatcaaag gtttactggt tatagatgat ccatatgaac caccgtgtag ttgtgagata 840
 gtattacaac agaaaggaag tgactgtaag tctcccagtg atatggctga agaagtata 900
 tcctacttgg aggagaacgg atacctgcgg gcttga 936

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 <211> 311
 <212> PRT
 <213> Glycine max

<400> 8
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 Phe Pro Lys Leu Arg Gly Ile Asn Val Thr Gly Leu His Cys Gly Arg
 35 40 45
 Arg Gly Leu Val Leu Val Leu Arg Ala Lys Ser Lys Pro Ile Arg Ala
 50 55 60
 Lys Glu Asn Ala Ser Val Ser Ala Ser Leu Ile Asp Asp Trp Phe Lys
 65 70 75 80
 Pro Ile Thr Ala Lys Glu Asp Ser Asn Ala Glu Asp Arg Thr Ser Ser
 85 90 95
 Phe Ser Gly Lys Asn Leu Thr Gln Met Ser Asn Val Gly Asn Ser Thr
 100 105 110

Asn Ile Met Trp His Asp Cys Pro Ile Gln Lys Gln Asp Arg Gln Gln
 115 120 125
 Leu Leu Gln Gln Gln Gly Cys Val Ile Trp Leu Thr Gly Leu Ser Gly
 130 135 140
 Ser Gly Lys Ser Thr Ile Ala Cys Ala Leu Ser Gln Ser Leu His Ser
 145 150 155 160
 Lys Gly Lys Leu Ser Tyr Ile Leu Asp Gly Asp Asn Ile Arg His Gly
 165 170 175
 Leu Asn Gln Asp Leu Ser Phe Arg Ala Glu Asp Arg Ser Glu Asn Ile
 180 185 190
 Arg Arg Ile Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Val Ile
 195 200 205
 Cys Ile Thr Ser Leu Ile Ser Pro Tyr Gln Lys Asp Arg Asp Ala Cys
 210 215 220
 Arg Ala Leu Leu Ser Lys Gly Asp Phe Ile Glu Val Phe Ile Asp Val
 225 230 235 240
 Pro Leu His Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu
 245 250 255
 Ala Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr
 260 265 270
 Glu Pro Pro Cys Ser Cys Glu Ile Val Leu Gln Gln Lys Gly Ser Asp
 275 280 285
 Cys Lys Ser Pro Ser Asp Met Ala Glu Glu Val Ile Ser Tyr Leu Glu
 290 295 300
 Glu Asn Gly Tyr Leu Arg Ala
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<210> 9

<211> 928

<212> DNA

<213> Triticum aestivum

<400> 9

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 agaggcagga actgctaaat cagaagggtt gtgttgtgtg gataacaggg ttaagtgggt 240
 cagggaagaa cactactagca tgcgcgctaa gtcgcgagct gcaactccaga ggatcatctga 300
 cctacattct agacggtgac aatctaaggc atgggttaaa ccgagacctc tgtttcgaag 360
 caaaggaccg tgctgaaaat atacgcagag taggagaagt agcaaagctg tttgcagatg 420
 ctggtctgat ctgcattgct agcttgatat caccctacag aagtgaacgc agcgcttgcc 480
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 gtgaagctag ggatccaaaa ggcttgatca agcttgccc tgcaggaaaa atcaaagggt 600
 ttactggaat tgatgatcct tatgaagcac cttctgactg cgagatagtg atacagtgc 660
 aagctgggtga ctgcgccacg cctaaatcga tggctgatca agttgtgtca tatcttgaag 720
 caaatgagtt cttacaggaa tagagacgta tgctatggat gaaaaaacat tctgaaattg 780
 gatcgccaag ggatgtgaaa tatgaggtag tatttatgtc tagaaagagt gatgatagta 840
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928

<210> 10

<211> 246

<212> PRT

<213> Triticum aestivum

<400> 10

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Ala Gly Ile Asp Lys Leu Val Thr Ser Thr Val Gly Lys Ser Thr Asn
35 40 45

Val Leu Trp His Asp Cys Pro Ile Gly Gln Phe Glu Arg Gln Glu Leu
50 55 60

Leu Asn Gln Lys Gly Cys Val Val Trp Ile Thr Gly Leu Ser Gly Ser
65 70 75 80

Gly Lys Ser Thr Leu Ala Cys Ala Leu Ser Arg Glu Leu His Ser Arg
85 90 95

Gly His Leu Thr Tyr Ile Leu Asp Gly Asp Asn Leu Arg His Gly Leu
100 105 110

Asn Arg Asp Leu Cys Phe Glu Ala Lys Asp Arg Ala Glu Asn Ile Arg
115 120 125

Arg Val Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Leu Ile Cys
130 135 140

Ile Ala Ser Leu Ile Ser Pro Tyr Arg Ser Glu Arg Ser Ala Cys Arg
145 150 155 160

Lys Leu Leu His Asn Ser Thr Phe Ile Glu Val Phe Leu Asn Val Pro
165 170 175

Leu Glu Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu Ala
180 185 190

Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr Glu
195 200 205

Ala Pro Ser Asp Cys Glu Ile Val Ile Gln Cys Lys Ala Gly Asp Cys
210 215 220

Ala Thr Pro Lys Ser Met Ala Asp Gln Val Val Ser Tyr Leu Glu Ala
225 230 235 240

Asn Glu Phe Leu Gln Glu
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<210> 11

<211> 521

<212> DNA

<213> Triticum aestivum

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aggcaatggc ccagcaagtt ctgtcctacc ttgagaagaa cggatatttg caggcttagc 180
atatatatac tccagatcca gaagattgaa cttattcttc tgtgtccata actcatggac 240
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tgcctttttc acggggaaaag ggacgcagat cgatgatcag tttgattggt cggcattgct 360
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ggtgtgctgt gctgtgctgt gtttatttgt tggtaatgta tgatttgatt gtgggtgtca 480
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<210> 12
<211> 58
<212> PRT
<213> Triticum aestivum

<400> 12
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20 25 30
Gly Gly Glu Cys Pro Ser Pro Lys Ala Met Ala Gln Gln Val Leu Ser
35 40 45
Tyr Leu Glu Lys Asn Gly Tyr Leu Gln Ala
50 55

<210> 13
<211> 312
<212> PRT
<213> Catharanthus roseus

<400> 13
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20 25 30
Lys Leu Pro Val Asn Phe Gly Ala Phe Gly Ser Gly Gly Gly Glu Val
35 40 45
Lys Leu Gly Phe Leu Ala Pro Ile Lys Ala Thr Glu Gly Ser Lys Thr
50 55 60
Ser Ser Phe Gln Val Asn Gly Lys Val Asp Asn Phe Arg His Leu Gln
65 70 75 80
Pro Ser Asp Cys Asn Ser Asn Ser Asp Ser Ser Leu Asn Asn Cys Asn
85 90 95
Gly Phe Pro Gly Lys Lys Ile Leu Gln Thr Thr Thr Val Gly Asn Ser
100 105 110
Thr Asn Ile Leu Trp His Lys Cys Ala Val Glu Lys Ser Glu Arg Gln
115 120 125
Glu Pro Leu Gln Gln Arg Gly Cys Val Ile Trp Ile Thr Gly Leu Ser
130 135 140

Gly Ser Gly Lys Ser Thr Leu Ala Cys Ala Leu Ser Arg Gly Leu His
 145 150 155 160
 Ala Lys Gly Lys Leu Thr Tyr Ile Leu Asp Gly Asp Asn Val Arg His
 165 170 175
 Gly Leu Asn Ser Asp Leu Ser Phe Lys Ala Glu Asp Arg Ala Glu Asn
 180 185 190
 Ile Arg Arg Ile Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Val
 195 200 205
 Ile Cys Ile Ala Ser Leu Ile Ser Pro Tyr Arg Lys Pro Pro Asp Ala
 210 215 220
 Cys Arg Ser Leu Leu Pro Glu Gly Asp Phe Ile Glu Val Phe Met Asp
 225 230 235 240
 Val Pro Leu Lys Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys
 245 250 255
 Leu Ala Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro
 260 265 270
 Tyr Glu Pro Pro Leu Lys Ser Glu Ile Val Leu His Gln Lys Leu Gly
 275 280 285
 Met Cys Asp Ser Pro Cys Asp Leu Ala Asp Ile Val Ile Ser Tyr Leu
 290 295 300
 Glu Glu Asn Gly Tyr Leu Lys Ala
 305 310

<210> 14

<211> 276

<212> PRT

<213> Arabidopsis thaliana

<400> 14

Met Ile Ala Ala Gly Ala Lys Ser Leu Leu Gly Leu Ser Met Ala Ser
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 20 25 30
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 35 40 45
 His Asn Lys Asn Gly Ser Ile Pro Glu Val Lys Ser Ile Asn Gly His
 50 55 60
 Thr Gly Gln Lys Gln Gly Pro Leu Ser Thr Val Gly Asn Ser Thr Asn
 65 70 75 80
 Ile Lys Trp His Glu Cys Ser Val Glu Lys Val Asp Arg Gln Arg Leu
 85 90 95
 Leu Asp Gln Lys Gly Cys Val Ile Trp Val Thr Gly Leu Ser Gly Ser
 100 105 110

Gly	Lys	Ser	Thr	Leu	Ala	Cys	Ala	Leu	Asn	Gln	Met	Leu	Tyr	Gln	Lys
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Gly	Lys	Leu	Cys	Tyr	Ile	Leu	Asp	Gly	Asp	Asn	Val	Arg	His	Gly	Leu
		130					135					140			
Asn	Arg	Asp	Leu	Ser	Phe	Lys	Ala	Glu	Asp	Arg	Ala	Glu	Asn	Ile	Arg
145					150					155					
Arg	Val	Gly	Glu	Val	Ala	Lys	Leu	Phe	Ala	Asp	Ala	Gly	Ile	Ile	Cys
				165					170					175	
Ile	Ala	Ser	Leu	Ile	Ser	Pro	Tyr	Arg	Thr	Asp	Arg	Asp	Ala	Cys	Arg
				180					185					190	
Ser	Leu	Leu	Pro	Glu	Gly	Asp	Phe	Val	Glu	Val	Phe	Met	Asp	Val	Pro
		195					200					205			
Leu	Ser	Val	Cys	Glu	Ala	Arg	Asp	Pro	Lys	Gly	Leu	Tyr	Lys	Leu	Ala
		210					215					220			
Arg	Ala	Gly	Lys	Ile	Lys	Gly	Phe	Thr	Gly	Ile	Asp	Asp	Pro	Tyr	Glu
225					230					235					
Pro	Pro	Leu	Asn	Cys	Glu	Ile	Ser	Leu	Gly	Arg	Glu	Gly	Gly	Thr	Ser
				245					250					255	
Pro	Ile	Glu	Met	Ala	Glu	Lys	Val	Val	Gly	Tyr	Leu	Asp	Asn	Lys	Gly
				260					265					270	
Tyr	Leu	Gln	Ala												
		275													